SECTION 5

INFORMATION TECHNOLOGY ARCHITECTURE

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INFORMATION TECHNOLOGY ARCHITECTURE

FEATURED IN THIS SECTION

SECTION 5...IT ARCHITECTURE

5.1 ENTERPRISE ARCHITECTURE

This section of the Plan identifies the current information technology architecture implemented in Fairfax County. The County's technology architecture is a strategic asset that defines technology components necessary to support business operations and the infrastructure required for implementing new technologies in response to the changing needs of government business. It is a multi-layered architecture that includes IT architecture segments including:

- Application and Data Architectures
- Platform Architecture
- Network Architecture
- Internet Architecture
- Security Architecture

5.2 IT ARCHITECTURE PROCESS MODEL

Enterprise Architecture (EA) is the blueprint or roadmap by which specific technology solutions are created. Architecture defines how technology is used to enable business solutions. It also must be flexible enough to allow expansion and change as requirements evolve or technology becomes obsolete or is updated. Architecture as a foundation and roadmap, also allows the county to understand how new requirements and technology changes will affect it and allows new technology opportunities to be captured as part of an updated blueprint to benefit others. EA improves the efficiency and effectiveness of technology investments by reducing redundancy and promoting the sharing of knowledge and best practices across county government.

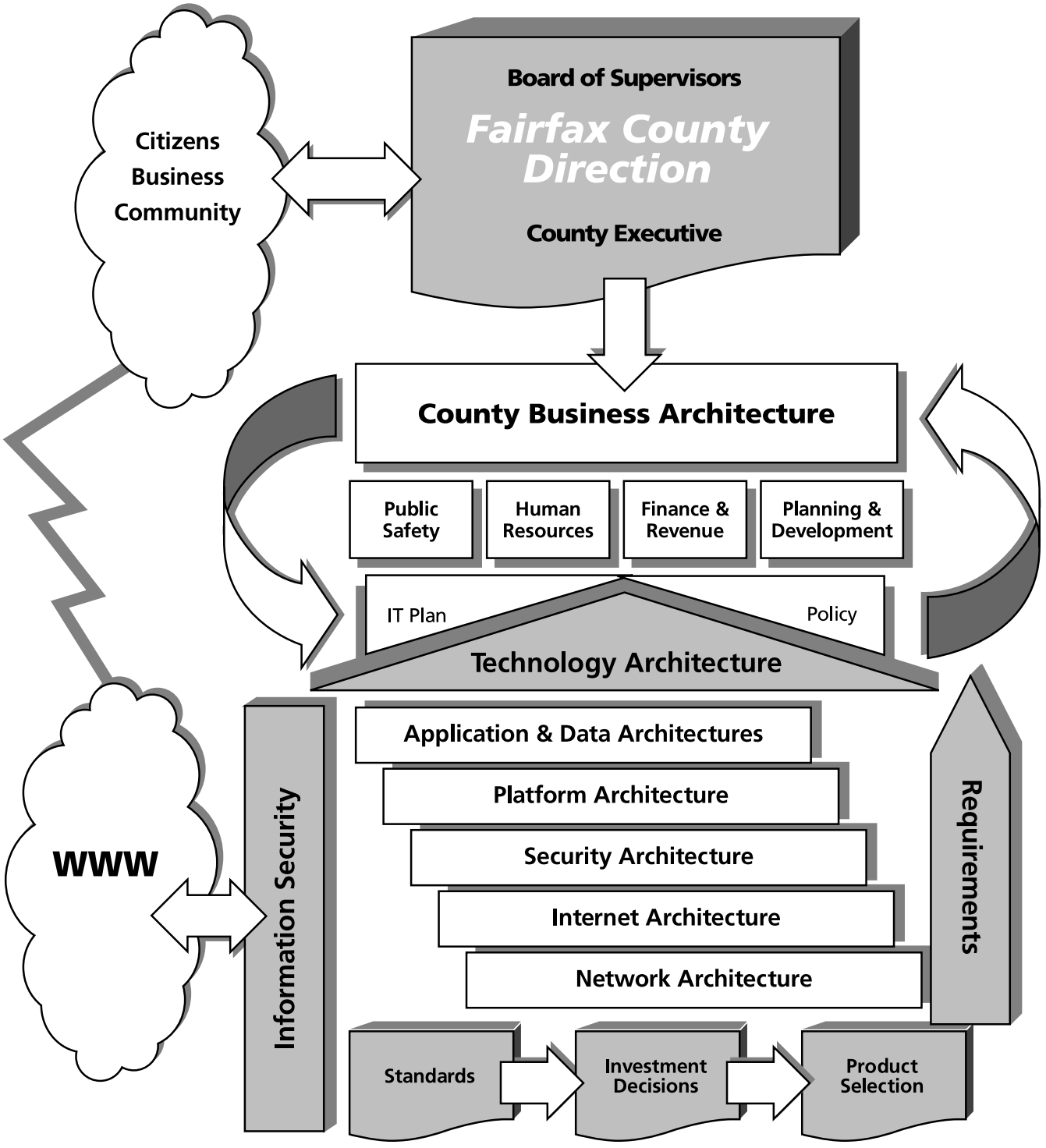
The Architecture Process Model on the following page illustrates the inter-relationships between the County's IT and business architectures, and the iterative processes involved to ensure the development of an IT architecture that is efficient, cost-effective and business driven. For the purposes of the County's model, the business processes have been grouped into four major functional areas; Human Services (HS), Public Safety (PS), Planning and Development (PD), and Finance & Revenue (F&R), which reflect the compartmentalization of County services for delivery as well as evaluation purposes.

The model is based on the mission statement for Information Technology, specifically:

"Delivery of quality and innovative information technology solutions for agencies and those doing business with Fairfax County Government."

This mission is what directs the County's information technology activities. Every effort undertaken is framed against this mission statement.

Enterprise IT Architecture Model



5.3 APPLICATION & DATA ARCHITECTURE

The application architecture defines how applications are designed and how they cooperate. The architecture promotes common presentation standards and enables a high level of system integration, and storage and retrieval of data. It should facilitate the reuse of components and rapid deployment of applications in response to changing business requirements. This layer includes elements of the technology architecture that converts business process to business intelligence, the overall goal being to ensure that County services are executed in a timely, efficient and cost-effective manner. The County has a vast inventory of enterprise-wide and agency specific production applications residing on mainframe, mid-size computer and microcomputer platforms. New applications and application enhancements are constantly being evaluated, developed, acquired, and implemented as older "legacy" applications are retired.

The County's goal for this layer is to use and create industry standard application development tools and language environments that are adaptive in client/server and Web-enabled models. Further, this should allow the County to protect its investment in 'classic' systems by providing enhancements that facilitate greater user-friendliness, better data manipulation and reporting, and end user controls. In addition, by keeping abreast of emerging technologies such as Web Services, XML, and so forth, the County is positioning itself to take advantage of the opportunities these technologies offer. An exhaustive discussion is beyond the scope of this section; however, some examples of the County's application architecture and some recent developments are described here.

As the County moves toward finding a balance between COTS vs. in-house development, a new framework for development activity is being put in place. First and foremost, this new framework will incorporate the concepts of Software Engineering and Application Development Methodology. These principles and techniques will be used to augment the current Application Life Cycle Standards (ALCS). This approach will encompass application life cycles from "cradle to grave"; that is, from the earliest stages of planning, through requirements and design, to implementation and post-implementation support. These new applications will be built on the most current and promising platforms, and an architectural framework based on the future of IT, not on the past. While existing legacy systems will continue to be supported, a dramatic move is also underway to embrace new development platforms such as .Net and emerging standards such as XML and Web Services.

The .Net platform will provide the foundation for the next generation of both departmental and enterprise-wide applications. .Net provides a stable application environment with more opportunity for componentization of business logic, sharing of common components and the integration of business processes across application boundaries. A new class of tools such as Visual Studio.Net will provide County developers with a robust and flexible development environment. Encapsulating both existing and new business logic into "Web services" will provide the ability to expose business processes across organizational and application boundaries, not only within the County, but with other jurisdictions, the state, and the federal government, as well as with business partners. XML will provide the common "glue" to hold together and provide consistent information across these boundaries to facilitate the need to share data from disparate platforms and systems. Enterprise Application Integration (EAI) products such as WebMethods will allow a virtually unlimited ability to share, and bring into this new environment, information and business process from older, mainframe and client/server applications. With the ability to extend these business processes even more through the use of ASP code, the result will be a product that is greater than the sum of the parts.

A detailed "Architectural Framework" document is being developed and is expected to be available in the 1st quarter of FY03. This framework is intended to be an organic document which will be flexible enough to reflect and incorporate the rapid advances in Information Technology.

Office Systems — Fairfax County uses the MS Office Suite installed on PCs attached to LAN-based servers

and printers to facilitate shared file and printing requirements for word processing, spreadsheet, groupware presentation software, workflow database applications, project management and collaborative group work process and workflow.

Production Applications — Fairfax County is in the midst of overhauling and updating many of its administrative applications as well as acquiring new applications. Key applications in the midst of development or further enhancement include the County's land development systems, tax systems, public safety systems, library system, various human services systems, and human resources management systems. IT maintains approximately 65 mainframe-based applications for Fairfax County agencies that support finance, purchasing, personnel, public safety, and planning and development of business operations. The majority of the mainframe applications utilize CICS, using programming language architectures such as COBOL, SAS and EASYTRIEVE PLUS, with DB2, IDMS and VSAM databases. Efforts are underway to convert IDMS based applications to new technology. The current mainframe ('enterprise server') is an IBM 9672 with 1.5 Terabytes of storage, running OS/390. Access to the mainframe systems is provided by mainframe "dumb" terminal emulation software. The mainframe systems utilize text-based screens with user knowledge required of the application commands and function keys.

DIT has deployed Web-enabled GUI front-end versions of several mainframe applications to facilitate easier access to system data. In addition, there are several projects underway to Web-enable other corporate systems to meet end user demands for GUI access to County business data. DIT also maintains 35 server-based applications for agencies that provide Windows GUI access to a server resident database. The majority of the server applications are "Fat Client" in nature with ORACLE as the primary database residing on IBM p-Series, SUN and/or Dell NT servers.

There are also "Fat Client" server-based Agency applications that are maintained separately by agency IT personnel. The large majority of the Agency server applications use Microsoft Access or Microsoft SQL Server as their database and programming language architecture; a few applications use "older" database software such as dbase, Paradox, r:base and X: Base, which will be eventually converted. The IT standards call for complex, Internet accessible or high access databases to use Microsoft SQL Server, DB2 or Oracle.

Most agency server-based systems reside on Windows 2000 or Windows NT servers that support both applications and file and print server-sharing requirements.

Geographical Information System Applications (GIS) — GIS is a specialized system for storing, retrieving and analyzing an array of digitized map layers that collectively record the topographic, demographic and other features of every location in the County. GIS can be used to identify the shortest route from one location to another, generate school bus and sanitation truck routes, locate sewer lines and other utilities, plan development and many other useful tasks. Our system currently has over 200 layers of GIS data. The County is continuing to develop its GIS data and implement new applications in support of agency functions.

5.3.1 The Application Tools

Application tools are the information technology components used to develop and support the functioning of the applications. Application tools also include the support systems used to facilitate work planning and communications.

Programming/Development Tools — New applications are currently being developed using fourth generation object oriented languages and tools. This approach will continue as additional client/server applications are developed and as Commercial-Off-The-Shelf (COTS) system components are purchased. Standard life-cycle methodologies are employed to define, develop and implement new systems. The models and design documents that are created are updated throughout the system development and maintenance life cycle. In specific instances, expert system technology has been used to incorporate complex rule based functionality into systems. Third and fourth generation languages and tools are used in only a few specific development efforts and as utility programs on the mainframe tier of some client/server

systems. New developments are using ASP and ASP.NET and Dreamweaver for the presentation layer. The County recently purchased webMethods, a suite of tools to assist in the integration of applications at the presentation, business logic, and data layers. Software Engineering technologies are being incorporated into the Application Life Cycle Standards (ALCS) to provide a disciplined and consistent development approach.

Database Management Systems (DBMS) — The County uses several database management systems to support its business applications. On the mainframe, applications use DB2, IDMS, and VSAM databases. Although IDMS and VSAM are used by many of the County's mainframe legacy applications, DB2 is the preferred database solution for any new mainframe applications. For UNIX or Windows 2000 platforms, Oracle or Microsoft SQL Server is the County's database standards. Oracle Gateway and Neon's Shadow Direct are used to enable access of mainframe DB2 databases. Crystal, QMF, SAS and Easytrieve Plus support ad-hoc query and reporting on the mainframe databases. Relational database design activities, such as creating entity-relationship diagrams, the data dictionary, the process models, the logical and physical data models, and the database definition language, are supported through the COOL:BIZ and ERWIN tools.

Office Automation/Workstation Software — The County office automation tools are the Microsoft Office Suite including Word for word processing, Excel for spreadsheets, PowerPoint for presentations, Access for desktop application databases, Exchange/Outlook for e-mail/groupware, and Internet Explorer for Web browsing. Other desktop software used includes Microsoft Project for project management/tracking, and Norton AntiVirus. The County's voice mail system is ROLM PhoneMail.

GroupWare/Collaborative Software — The County uses Group Systems as its primary collaborative group software in the Group Decision Support Center. Groups use the computer-supported meeting center and its software to conduct process improvements, strategic planning, program evaluation, and vendor selection sessions. Other software is used to support activities dealing with the group output/results, e.g., Microsoft Exchange, Word, Excel, databases, presentation and process modeling software.

GIS Software — The ARC/INFO software provides high-end workstation tools and functionality to the GIS analyst. The software integrates visual or graphic data in the form of maps, with descriptive or attribute information from an organization's internal databases. ARC/INFO provides the tools for analysts to access, visualize, and query both graphic and tabular data for better analysis and decision-making. Additionally, ArcView GIS provides mid-range desktop GIS tools to the skilled-user for map creation and analysis of the County's geographic data sets. And finally, MapObjects and the Internet Map Server provide a method for distributing highly customized GIS based applications through the Internet /Intranet.

Technical Support Center-Help Desk Software — The Technical Support Center provides County employees a centralized point of contact for computer support. Using the Automatic Call Distribution telephone system to route calls and diagnostic tools such as ServiceWare Knowledge Paks, Microsoft Technet and technical documentation, the Technical Support Center has a high percentage rate of first call resolution. The client/server application Quintus CustomerQ, WebQ, the Intranet counterpart, and the Oracle database are accessed through the County's Enterprise System.

5.4 PLATFORM ARCHITECTURE

The platform architecture defines the technical components of the infrastructure including client and server platforms; the operating systems and interfaces supported; and equipment used to operate the applications and application tools. Fairfax County's platform architecture includes servers (OS/390 mainframe, IBM UNIX, SUN UNIX, and Microsoft Windows NT/2000), workstations and desktop microcomputers. There are over 300 servers that provide approximately six terabytes of storage for County business systems. Laptops, Palm Pilots, and other PDAs and hand-held devices also support employee access to Agency business systems. Over 9000 PC's provide end-user access to all County systems. All PC's use Windows 2000 or Windows 98 and the Microsoft Office Suite to support office automation requirements. Total server storage requirements have grown from 394 gigabytes in 1998 to the current total of six6 terabytes.

The County also uses state and other non-County hardware platforms as necessary. The following paragraphs describe the major features of the County's platform architecture.

5.4.1 The Platforms

Desktop PCs, Workstations and Peripherals — Increased use of microcomputer technology by all Fairfax County agencies has facilitated the streamlining of operations and improved the delivery of services to citizens. DIT continues to prescribe hardware platforms and desktop applications standards and procurement vehicles as a means of controlling costs. Standard desktop configurations allow for consolidated procurement and enhance the County's ability to provide technical support to all users. Microcomputers are replaced in accordance with the four-year Microcomputer Replacement Program cycle and the standards that are in place at the time. All County microcomputers and associated peripherals are centrally procured to achieve economies of scale and consistent hardware platforms throughout all agencies.

The current microcomputer platform standard consists of mostly Pentium based hardware running the Microsoft Windows 2000 operating system. County microcomputers are used for office productivity software, enterprise e-mail and groupware, application client software, Internet/Web access, and mainframe emulation. Office configuration standards are depicted in the diagram on the next page followed by a table listing all County IT Standards for desktops and servers. The next wave of PC replacements deployed during FY 2003 will be using Pentium with the Windows 2000 operating system. This will be approximately one-half of the installed base.

Desktop and network printing is accomplished through a large inventory of stand-alone and network printers. Mainframe output is generated on two variable speed impact printers that support 2,000 to 4,000 lines per minute, and two advanced function printers that operate at speeds of up to 134 pages per minute. Agencies use a variety of laser-jet type desktop and high speed LAN based printers in offices. The County is also in the process of deploying Xerox, network connected multi function devices that provide high quality, high volume and speed printing, copying, faxing and scan image capabilities. These devices will be replacing older, obsolete copy only machines across the enterprise.

LAN-based Network Servers — Fairfax County has begun the migration to its new LAN operating system standard, Active Directory, which is an essential component of the Microsoft Windows 2000 architecture. However, the County still supports Microsoft Windows NT Server. In addition to the current NT and Windows 2000 servers the County also supports UNIX servers that are used for those agency specific applications that require a more robust server platform. Both the IBM p-Series and SUN UNIX servers are supported.

CITRIX Meta Frame Servers are used for many of the business applications that require "thin-client" technology to minimize Wide Area Network traffic, optimize the efficiency of fat client-server applications, and streamline desktop PC support activities.

TABLE I

This table contains details on centrally managed LAN-based servers:

Mid Range Platform	Number of Servers
AIX	17
NT	220
Solaris	5

MAINFRAME (Enterprise Server)

Fairfax County supports its major business and legacy applications on an IBM mainframe. The OS/390 operating system will be migrated to z/OS in FY 2003. It is partitioned into logical machines, serving over 20,000 agency users at over 200 locations.

Device	Machine
Mainframe Computer	IBM 9672-R26-CMOS 3 GB real & expanded memory 17 parallel channels 46 ESCON channels 2 FICON channels 1 OSA channel
Disk Subsystem	SAN (Hitachi 9600)
Tape Subsystem	IBM 3494 Automated Tape Library IBM 3590E Drives IBM 3480 (cartridge) IBM 3420 (reel-to-reel)
Printers	IBM 3900 Laser IBM 6262 Impact

5.4.2 Storage Area Network

In order to accommodate the incredible growth in data and better manage the storage environment, Fairfax County is utilizing a Storage Area Network (SAN). Implementation of this technology was begun in FY 2002 with an initial eight Terabytes of storage. Platforms connected to the SAN include the mainframe server, Windows NT servers, Windows 2000 servers, IBM RS/6000 and SUN servers.

The primary SAN benefit is enabling server access to a centralized pool of storage, thus providing administrators with greater flexibility in realigning storage capacity to the servers that need it.

Storage Management requirements addressed by the SAN are:

- Scaleable storage capacity that can allow users to increase their storage as needed.
- Modular, adaptive architectures that allow users to deploy storage in a variety of centralized and distributed environments with re-deployment capabilities when needed.
- Highly available architectures to prevent downtime.
- Cross-platform solutions that support a variety of operating systems, allowing users to reduce costs by standardizing on a single enterprise storage solution, rather than operating system specific solutions.
- Higher levels of performance to support the ever-growing amounts of data that are being put online.
- Higher performance backup and restore operations to support shrinking backup windows.
- The ability to share data across the enterprise rather than building “islands of data.”
- Management tools that are easy to use and centralized while allowing the hardware and data to be “distributed.”

5.5 NETWORK ARCHITECTURE

The County's communications infrastructure includes both voice and data technologies and the various topologies, transmission services and protocols necessary to facilitate the interconnection of server platforms, intra-building and office networks (LANs), inter-building and campus networks (WANs). The County's voice and data networks continue to grow, in terms of cost, sophistication, and increased demand on our communication staff.

The Communication Group now supports over 12,500 data ports and over 15,000 voice ports. Additionally, initiatives already in place and those planned have resulted in many significant changes with many more occurring in the future. The Gartner Research Group and others now document that network technologies refresh every 18-24 months. This will provide more challenges for County fiscal and staff resources, as the County strives to keep network standards in line with standard business requirements, security and other support needs. The communications plan strives to take into account growth, based on the needs of County agencies as programs expand, which in turn require new or expanded network resources to provide both intra and inter County links. Already, the Internet and Web-enabled applications have rapidly expanded, requiring expansion of our ISP connection from a single T1 to a high capacity DS3. Future initiatives and technologies, such as e-Government applications, streaming video, teleconferencing, and more integrated and complex applications drive the requirements for the County's communication infrastructure and its components, thus the requirement to update and/or enhance annually.

The goal of Fairfax County's Communication Group is to provide a network that is responsive and reliable for the user and the user's application and will allow for the uninterrupted flow of voice, data, and video information. To this end, the County is working on several projects that will boost and consolidate the underlying physical infrastructure supporting voice, data, and video, while at the same time providing increased, cost-effective bandwidth potential, and improved output. The best opportunity recognized is through the completion of the I-NET, a metropolitan fiber ring that will connect over 400 County and schools facilities. The County views a strong, viable communications infrastructure as a vital component in the overall IT strategy toward maintaining its success in deploying cost-effective solutions that optimizes its business goals, and maintains its reputation as a leader in technology.

5.5.1 Enterprise Data Communications Network

The Enterprise Data Communications Network for Fairfax County Government serves as the data communications backbone that provides countywide access to information technology resources. Operated by the Department of Information Technology Infrastructure Division, the Enterprise Data Network connects approximately 12,500 computer devices in over 200 locations. These computer devices include personal computers, terminals, printers, network servers, communications equipment (routers, switches, hubs), modems, UNIX workstations and servers, mini-computers, and the mainframe computer.

The Enterprise Network supports equipment and systems from multiple vendors, which require multiple communications protocols. All supported network systems are based upon open standards, and compliance with published standards is required for any network-connected device or system. Gigabit Ethernet is used as the backbone of the Government Center campus and a mixture of 400MB Ethernet Channels and Gigabit Ethernet are used at the public safety campus. The two Campuses are connected via a DS3 Frame-Relay circuit. The standard desktop connection is switched 10/100 Ethernet. Fairfax County is implementing a pure TCP/IP network, but still supports IPX/SPX protocol for several NetWare servers until their migration to Windows NT/Windows 2000 is complete in mid-summer 2002.

The Enterprise Wide Area Network (WAN) Architecture for Fairfax County is ATM. The current WAN backbone consists of two OC-3 (155MBPS) circuits

into the Government Center campus providing redundant trunks for the remote sites. At the remote sites there is a mixture of frame-relay circuits providing access speeds of 56K, fractional T-1, and full T-1 service. Over the next twelve to eighteen months these frame-relay sites will be converted to native ATM circuits and access speeds at all sites will be upgraded to full T-1 capacity. Also, the OC-3 trunks will be increased to one OC-12 (622MBPS). This new WAN architecture will also be a fully meshed network providing redundancy to all remote sites including the Public Safety Campus. The new network will have highly sophisticated perimeter and internal security implementations to protect the County's electronic information. This new network design, including a renumbering scheme, security implementations and equipment, will permit the overlay of the new network onto the planned I-Net when that topology becomes available.

Network Management is currently supported on three platforms:

1. IBM Netview for MVS — Monitors mainframe and network resources.
2. IBM Tivoli — Monitors Enterprise network resources including routers, switches, etc.
3. CISCO Works 2000 — Monitors all Cisco installed equipment.
4. CA Unicenter being implemented in FY 2003.

Mainframe connectivity is achieved through two primary gateways. The first, a Cisco router using CIP (Channel Interface Processor), connects directly to the IBM Mainframe through a fiber-optic channel and supports a majority of the TN3270 (Telnet) sessions to the mainframe; the second, an IBM 3745 Communications Controller used to support the legacy SNA networks, which provides low speed mainframe only network connections to several remote sites. External hosts to which Fairfax County has network connections include the Fairfax County Public School system, Fairfax County Public Library, Fairfax County Water Authority, and several State of Virginia host systems. During the next several years, the County in association with Cox Communications and the Cable Franchise Agreement will construct a fiber-optic network to support data, voice and video communication to County and school facilities.

Remote access via dial-up, VPN, and Citrix services provides access to the County's Enterprise Network resources for telecommuters, vendors, remote access users, or business travelers, as well as many small Fairfax County offices. Approval for individual participation in the remote access program must be obtained from the appropriate Agency Director and forwarded to the Information Protection Branch of DIT. Security for remote access is managed through a Remote Access Server using security tokens and PIN numbers.

The Appendix Section illustrates the current overall configuration of Fairfax County's Enterprise Network, including connections to the County's mainframes and LANs, the Herrity and Pennino Buildings, the Public Safety Campus, the Internet, various external organizations such as the state and Fairfax County Public Schools, and remote access users. This diagram is updated periodically to reflect changes in the network configuration.

5.5.2 Voice Communications Network

The County's Voice Communications Network provides voice communications services to all Fairfax County Government agencies as well as various affiliates via County-owned PBX's, Centrex's, and key systems which are located in buildings throughout the County and connected via Telephone Company lines and several direct County-owned lines for campus locations. The services range from large call centers on the main campuses to complicated voice services, to residential services for County-operated group homes and apartments. Management and voice communication support are also provided for the primary and backup (alternate) 911 communications centers.

During FY 2002, a comprehensive study of the telecommunications architecture, including support issues, unique applications, and opportunities made available through the I-Net, was conducted. The result is a framework for a strategic direction to evolve the Counties communications capabilities and services.

Although the convergence of voice, data and video traffic into a single network is the ultimate goal for the County's communication architecture, the County currently uses a mix of digital and analog PBXs, digital electronic key systems, 1A2 Key equipment, Centrex, and single-line (POTS) equipment to meet its voice communication requirements. There are approximately 400 County locations, comprised of two major campus environments, large Human Services centers, Parks, Libraries, public safety sites (Police and Fire and Rescue), "911" Centers, health centers, etc. Additionally, the County has links to various agencies of the Commonwealth of Virginia, as well as other local jurisdictions.

The County's Communication Technologies Group supports over 15,000 phones, which use a combination of Siemens/Rolm, Toshiba, and Norstar systems, During an average month the County places over 1.3 million calls excluding intra-building calls. Below is a brief, but by no means complete, summary of the County's voice communications infrastructure.

- For voice communications, the main government centers and large buildings are serviced by Siemens ICN (formerly ROLM) CBXs with integrated voicemail systems. There is a mix of CBX 9722 platforms, as well as Rolm's Phone Mail releases 4.x, 5.x and 6.x.
- Fairfax County's main Government Center's voice traffic is served with a four-node 9751-70 and the County's Public Safety Center located at the Massey campus with a four-node 9000. These systems are interconnected via DS1 tie lines using the existing coaxial Institutional Network.
- Voice communications to our smaller remote sites, including Libraries, Parks, health centers, etc., are served by Toshiba DL systems, of which some have integrated voicemail. The County also has one AT&T (Lucent) system 75 PBX (soon to be replaced with new Lucent equipment) and one Mitel 200D PBX.
- Police and Fire and Rescue stations use Verizon 9-1-1 leased 1A2 key and equipment and Norstar Systems. They also maintain a 48-port conference bridge.
- Voice needs of our very small offices, i.e., small Human Services and community services sites are supported by POTS service and single-line analog sets.
- Various agencies also use centralized IVR services with connectivity provided via Verizon T-1 and numerous channel banks at distant sites. These services have greatly improved Fairfax County government's ability to provide quality services to its citizens and business clientele.

5.5.3 Emergency Communications Network

The emergency communications networks that the County maintains are divided into two categories: Public Safety Radio Network and Public Service Radio Network.

A. PUBLIC SAFETY RADIO NETWORK

Voice Network — The County operates a digital, 800MHz trunked voice radio system that supports the operations of the Police, Fire and Rescue, and Sheriff's Departments, with more than 3,000 mobile and portable radios. This system infrastructure is also utilized by the County's Public Schools Security Department, and by the independent police department of the City of Fairfax, and the Towns of Herndon and Vienna. Equipment is located at nine locations throughout the

county, and all sites are linked together by a redundant VERIZON SONET network. The system provides for voice interoperability with and between the public safety agencies of Arlington County, City of Alexandria, Metropolitan Washington Airports Authority, City of Manassas, City of Manassas Park, as well as the District of Columbia Fire Department. The public safety agencies of Loudoun County, Prince William County, and Montgomery County will be added to the interoperability compatibility as they activate their own new radio systems during FY2003. Fairfax County plans to expand this public safety radio system by adding three additional tower site locations in the FY2003-FY2004 timeframe.

Mobile Data Network — To support operations of the various public safety agencies, the County operates a 450MHz mobile data communications system (MDCS) that ties the response vehicles of the Police, Fire and Rescue and Sheriff's departments to the County's Computer-Aided Dispatch (CAD) system, as well as access to various databases maintained by the Commonwealth of Virginia and the Federal Bureau of Investigation. This system consists of more than 900 Mobile Computer Terminals (MCT) and Vehicular Radio Modems (VRM) in vehicles of the various agencies, with transmitting equipment located at six sites in the County.

B. PUBLIC SERVICE RADIO NETWORK

The County currently operates a 1980s-era trunked radio system of more than 3,000 mobile and portable radios for the Department of Public Works and Environmental Services, Public Schools Transportation (school bus fleet), Park Authority, Water Authority, FASTRAN, and other non-public safety County agencies. This current zoned radio system consists of two transmitter sites in Fairfax City and in Lorton. The County plans to replace this outdated radio system, which has insufficient geographical coverage to meet user requirements, with a state-of-the-art, 800MHz analog trunked radio system. The system design consists of six tower site locations, and will provide additional capacity to users and a "seamless" environment, which will not require County vehicles to change channels as they move through radio zones.

5.5.4 Institutional Network (I-Net)

This fiber optic network will arguably become the most cost-effective, viable, and lucrative technological advance the County has experienced since computers first appeared in the County's technology inventory. This fiber optic network will provide virtually "unlimited" bandwidth to meet the County's present and future communication network requirements. It will truly become the "super highway" for the County's internal video, voice and data communication network. Although similar bandwidth is available through local telecommunication companies, it comes at a significant price, a loss of flexibility, and for some services, only limited availability. The I-Net's "unlimited" bandwidth, albeit with some significant upfront cost, will allow the County to amortize its cost over the life of the I-Net with an overall cost savings.

The County's I-Net fiber network infrastructure will provide broadband capabilities that will permit data, voice and video communications directly to the desktop facilitating high speed data communications, Voice over IP services, video broadcast, videoconferences, streaming video, and distance leaning (for example). It will be through this I-Net that the County will truly reach its ultimate goal of converged voice, data and video technologies. The network will have several origination points, and a facility for programming or controlling the switching and routing of data, voice and video signals among all participating sites. The network could include telemetry facilities for remotely controlling and adjusting video equipment for such functions as panning, tilting, zooming, and adjusting the lighting. Finally, the network may contain a centrally administered signal security capable of restricting video and audio reception to designated sites.

A. I-NET VOICE/DATA SERVICE

As with the video world, the I-Net fiber network will provide greater capability for the County's voice and data networks and will allow the County to reach its goal of a truly "transparent" network. The I-Net's broadband capabilities will enhance our Voice over IP services and permit IPTV, videoconferences, and

streaming video directly to the desktop. Convergence of our existing voice communications to VoIP and IP telephony, will allow the County to reach its long term goal of restructuring its dialing plan to include five digit dialing to and from any County facility and eliminate current packet charges between sites. Additionally, the integration of voice and data will enhance County-wide productivity through applications such as, Unified Messaging, integration of the phone system with Exchange/Outlook's address book, Call Center Management, etc.

The I-Net provides the potential for a fully converged voice, data and video communications facility. However, although the I-Net is envisioned to result in considerable cost savings by replacing a significant portion of the County's Wide Area data Network and intra-County voice circuits, some existing data and voice circuits will remain for backup and redundancy, as well as to meet special functions, such as the 9-1-1 Center and the Emergency Operations Center.

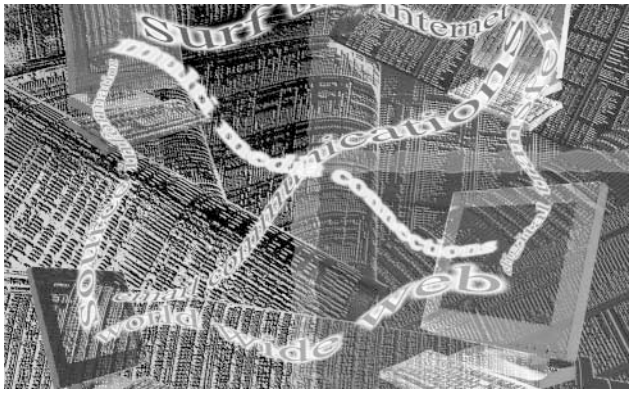
B. I-NET VIDEO NETWORK

The County's I-Net fiber network infrastructure will provide broadband capabilities that will permit video communications directly to the desktop facilitating broadcast, videoconferences, and distance leaning (for example). The network will have several origination points, and a facility for programming or controlling the switching and routing of video signals among all participating sites. The network will be able to carry signals that can be converted to and from analog video. Minimum signal-to-noise ratio will be 50dB at the most distant sites end-to-end (round trip). Video performance characteristics should meet or exceed those established by FCC Standards (Part 73.699) for broadcast video transmission. The network could include telemetry facilities for remotely controlling and adjusting video equipment for such functions as panning, tilting, zooming, and adjusting the lighting. Finally, the network may contain a centrally administered signal security capable of restricting video and audio reception to designated sites.

It should be noted that although the I-Net is envisioned to result in considerable cost savings by replacing a significant portion of the County's Wide Area data Network and intra-County voice circuits, some existing data and voice circuits will remain for backup and redundancy, as well as to meet special functions, such as the 9-1-1 Center and the Emergency Operations Center.

5.6 INTERNET ARCHITECTURE (E-GOVERNMENT)

The Fairfax County Internet architecture provides significant and wide-ranging opportunities to utilize emerging technology as a means to make information more readily available to County staff, citizens, and businesses. In addition, the interactive nature of the technology allows residents and others to conduct business (e.g., pay taxes, apply for permits, etc.) with the County at their convenience and from their location. Likewise, Internet technology allows access to enterprise data (real estate assessments, Human Services resource database, etc) without the need for a resident to call or visit the County Government center complex.



The e-Government architecture defines the standards, technologies and guidelines for public access, and conducting electronic business among County agencies, state agencies and outside entities. The County's Internet architecture is/will be comprised of the following:

- **High Speed Connection to the Internet** — The County's fractional T3 (18Mb) connections to the Internet. These connections provide access to the Internet by County staff as well as outside access to the County's Web server(s) by residents, business, and others via the Internet.
- **Public Access Web Server** — The County's Public Access Web Server provides Internet users with a vast amount of information made available by various agencies within the County. The Web server can be viewed as an "on-line service counter" where residents and others may obtain information related to services, licenses, taxes, recreation, court filings, and so on. The Web server also acts as the distribution or collection point for information obtained from or provided to enterprise databases via an "Application Server."
- **Intranet Web Server** — The County InfoWeb Intranet Web server provides the same type of facilities but access is limited to County staff.
- **Application Servers** — provide the gateway between the County Web servers and the information stored in County enterprise databases. The application servers do the work of communicating with various databases on the County mainframe and other platforms, accessing and collecting the requested information, formatting the information in the appropriate way, updating the database where appropriate, and returning the result to the Web server for dissemination to the requestor. Application servers also provide additional levels of security to ensure that only allowable information is accessible.
- **The WebBoard Server(s)** — provide a mechanism for visitors to the County site to engage in ongoing discussions in either "real time" chat or, more commonly, by use of a localized version of Internet "newsgroup-style" discussion forums. These forums provide residents the opportunity to discuss a range of topics among themselves as well as with County officials and staff.
- **Interfaces** — between the County Application servers and the enterprise databases provide the link that allows access to data residing in a wide array of sources. The interfaces make it possible to access data from virtually all of the County databases: DB2, IDMS, VSAM, Oracle, MS Access, Paradox, and so on. The interfaces are comprised of "Application Program Interfaces" (APIs), Open DataBase Connection (ODBC), and other products that provide the access layer for the architecture.

5.7 SECURITY ARCHITECTURE

The Information Protection Architecture defines the security standards and policies necessary to protect the information assets of the County, and make various information layers available to the County's workforce and citizens as appropriate. The Security layer employs basic security principles, coupled with a hardware and software infrastructure supported with applicable policies, plans and procedures. This architecture is designed to provide an appropriate level of protection for all County information processing resources regardless of platform. The objectives of this information protection program are to ensure confidentiality of information, integrity of data, systems and operations, and to ensure availability of information processing resources. The basic elements of identification and authentication, access control and monitoring of information processing activities are employed throughout the enterprise. The Least Privilege Concept of Access is utilized. Users are granted only that access necessary to perform job functions and all access must be explicitly granted, as opposed to the users having complete access unless specific access is denied. Protection capabilities inherent in operating systems, applications and commercially available software are used to achieve and maintain an acceptable level of protection. Activities and operations of information processing systems are monitored to ensure that an acceptable level of information protection is maintained.

In view of the dynamic environment of information technology, the security architecture continues to evolve to meet the challenges arising with employing new technologies. The infrastructure is maturing to meet challenges currently associated with the employing technologies necessary to conduct e-Government activities. Sound security architecture for operating in a protected manner in the high-tech arena is currently being identified, evaluated, and implemented to successfully meet the challenge of e-Government.

Identification and authentication, access control, and auditing functions are performed on the specific platform using the capabilities inherent in the appropriate operating system. At the server level, these activities are performed on the server taking advantage of the server's operating system. At the mainframe level the capabilities of the IBM operating system are used. Mainframe security functionality is performed by, Secure Way (formerly known as RACF) with each County employee having a unique UserID. Authentication is based upon this UserID coupled with a password. This UserID is also used as an authenticator to establish user accounts on platforms other than the mainframe.

On such platforms, user identification and authentication, along with access control, is based upon a unique UserID associated with a password and is performed at the operating system level. Audit trails are also created by the operating system of the platform. In the case of the mainframe, Secure Way provides the audit functionality. On the Windows NT and Windows 2000 platforms, the operating system performs this function. With applications such as Oracle or DB2 auditing is done at the application level.

Firewall technology is used as the main perimeter defense with all access from the Internet routed through a firewall. The firewall is configured using a DMZ functionality model. Broad filtering and routing is accomplished at the firewall portion nearest the Internet connectivity while more granular filtering and routing to the internal network is performed by the firewall portion nearest the internal network connection. Sensitive internal resources are located behind the DMZ while other resources are located within or outside the DMZ. Firewall platforms are used and are configured to provide redundancy for operations. Should one fail, the back-up unit will automatically function as the primary element until such time as both units are brought back on-line. These platforms are specialized computers that provide protection by blocking unwanted traffic and directing incoming traffic to the network. The County's network employs a private/public network model. Sensitive and critical assets are located on the private portion of the network while information and services available for unlimited public use are located on the public section. Access is limited to sensitive and critical internal assets while resources needed by the public are protected to ensure that the resources are available.

Dial-Up Remote access uses a security token for authentication. Each user is issued a security token that is used in conjunction with the user's unique identifier. Remote access is approved at the same level as if the user were physically at his or her work site. Remote access is granted to those individuals who are approved telecommuters, users who periodically need to access the system from home or other locations, and individuals who need access while travelling.

With the emergence of e-Government, steps are now being taken to identify, evaluate and implement a more robust Security Infrastructure that will support such activity. Software, hardware and processes are being evaluated to modernize the infrastructure to permit the County to participate in e-Government activities while still providing adequate support to County resources.

5.8 TRAINED TECHNICAL AND CUSTOMER STAFF

At the base of the model is trained technical and customer staff. This is the key support element of all the County's information technology implementation efforts. It is critical that technical staff be trained on the technologies being brought into the County since they are the ones who will be required to ensure the continued effective deployment and use of the technology. Ideally, such training is supplied prior to deployment. In parallel with the training of technical support staff, it is equally important that the customer staff be trained so that they can effectively employ the technology provided.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